Crop Rotation

Changing the crops grown in a field, usually in a planned sequence.

How it Works

Crop rotations in Wisconsin typically include corn, legumes, and small grains. Rotations that include small grains and alfalfa can significantly reduce soil erosion. Alfalfa and other legumes in the rotation can save fertilizer costs because they replace the nitrogen that corn and other grains remove from the soil. Rotations reduce pesticide use by naturally breaking the cycle of weeds, insects and diseases.

Planning

- Design crop rotations to meet your farm's needs and goals for yields and erosion control.
- Rotations that contain small grains and hay provide better erosion control.
- Sod or hay-based rotations offer long-term crop production flexibility.
- Reduce the potential for nitrate leaching to groundwater by rotating crops that provide nitrogen (alfalfa, clover, soybeans) with crops that use nitrogen (corn, wheat).

Maintenance

- Consider the potential for herbicide carryover to avoid crop failure.
- Consider the nitrogen credit when replacing a legume with corn or other grains.

Any tillage method that leaves crop residue on the surface to reduce erosion.

How it Works

Crop residue left on the surface shields the soil from rain and wind until emerging plants provide a protective canopy. Crop residue also improves soil tilth, adds organic matter to the soil, and may even result in a little grain being left for wildlife. Less tillage reduces soil compaction and saves the farmer time and fuel.

Three basic crop residue management systems are common in Wisconsin:

- Mulch-till uses such implements as a chisel plow or disk to till the entire field.
- No-till leaves the soil and crop residue undisturbed except for the crop row where the seed is placed in the ground.
- Zone or strip-till uses coulters to till a 5"-7" strip for injecting starter fertilizer and planting in one operation.

Planning

- Plan for residue levels needed to reduce erosion. Planning for residue cover begins at harvest. Reduce the number of tillage passes and set tillage tools to shallower levels to leave more residue on the surface.
- Straight points and sweeps on chisel plows leave more residue than twisted points.
- Consider your soils and crop rotation. Heavy residue (corn, for example) on droughty soils can help conserve soil moisture; however, heavy residue on poorly drained soils can delay spring warming and drying.
- Nutrient and pest management practices might need to change as you farm with higher levels of residue.
- You may need different equipment suited to the type of crop residue management you plan to use.

Maintenance

- Measure crop residue using the "knotted line" method. Divide a line into 100 equal parts and stretch it diagonally across the crop rows. Walk along the line counting the number of marks that have residue under them. The total number of marks with residue under them is the percent cover for the field. Take three to five measurements in representative parts of the field.

Tilling and planting across the slope following the contours of the land, and breaking the field into alternating bands of row crops and hay or small grains.

How it Works

Farming on the contour creates small ridges that slow runoff water. In stripcropping, the small grain or hay strips slow runoff water, allowing infiltration and filtering sediment. Farming on the contour rather than up and down reduces fuel consumption and is easier on equipment.

Planning

- Longer, steeper slopes may require stripcropping rather than just contour farming.
- Irregular slopes may require more than one key contour line.
- Row crop strips need to be roughly the same width as hay or small grains; consider how many acres of row crops you need. Remember, hay strips will rotate to row crops over time.
- Rotating strips from corn to legumes allows corn to use the nitrogen added to the soil by the legumes.
- Consider whether herbicide carryover will be a problem.
- Replace end rows with grass or legumes, which will reduce erosion and make it easier to turn equipment.
- Use grass waterways where runoff is concentrated.
- Strip width will depend on slope, equipment and management.

Maintenance

- Keep strip widths consistent from year to year.
- In contour farming, establish a narrow, permanent strip of grass along each key contour line to avoid having to lay out new key lines every year.

Cover Crop

A close-growing crop that temporarily protects the soil during the period before the next crop is established.

How it Works

Cover crops such as cereal rye, oats and winter wheat are planted as soon as possible after harvest on fields where residue will not adequately protect the soil from wind and water erosion during winter and spring. Cover crops can also be used on sandy soils to reduce nitrate leaching. In some situations a cover crop can be planted after the last cultivation to provide a longer growing period.

Planning

- Cover crops are best suited to low residue crops such as soybeans or corn silage grown on erodible land.
- Seeding from late-August to mid-September is recommended. Cover crops need 30-40 days for good growth before a hard frost, so seeding after harvest normally won't allow time for the crop to grow and survive winter.
- Cover crops can be air seeded prior to harvesting soybeans or seeded conventionally after silage harvest or when cultivating.
- Many crops can be used for cover, although cereal rye is probably most common. Keep in mind that legume cover crops add nitrogen to the soil, and provide low-cost fertilizer for subsequent grain crops.

Maintenance

- The cover crop should be killed in spring by mowing or herbicide application. Tillage is not recommended because it will bury the residue. Early kill is important to reduce the risk that the cover crop will deplete moisture needed by the grain crop.
- Restrict grazing if necessary.

Grass Waterway

Shaping a natural drainageway and establishing grass to prevent gullies from forming in fields.

How it Works

A natural drainageway is graded and shaped to form a smooth, shallow channel and then planted to sod-forming grasses. The drainageway carries runoff water from the field and the grass prevents the water from forming a gulley. The vegetation may also trap some sediment washed from cropland, absorb some chemicals and nutrients in the runoff water, and provide cover for small birds and animals.

Planning

- The width and depth of the waterway will depend on the nature of the fields it drains.
- A grade stabilization structure (see page 13) may be needed at the bottom of the waterway to prevent a gully from forming.
- Use soil conservation measures on the fields to prevent siltation of the waterway.
- Significant land reshaping might be required in some situations.
- Establishing good cover quickly is critical. Tile drainage, mulching or other temporary cover might be needed until grasses are established.

Maintenance

- Lift equipment out of the ground and shut off spray equipment when crossing the waterway.
- Do not use the waterway as a roadway.
- Fertilize if needed and mow periodically, but wait until after July 15 when birds are done nesting.
- Be careful not to till into the edges of the waterway.
- Avoid end rows planted along the waterway, because they may allow gullies to form on the waterway edge.

Grade Stabilization Structure

An earthen, concrete or other structure built across a drainageway to prevent gully erosion.

How it Works

A dam or embankment built across a gully or grass waterway drops water to a lower elevation while protecting the soil from gully erosion or scouring. Structures are typically either a drop spillway or a small dam and basin with a pipe outlet.

Planning

- Pipe outlet structures are typically used if the area upstream of the dam can temporarily hold most of the water from a storm. Drop structures are used where the area upstream of the site has minimal storage capacity.
- Grade stabilization structures can be expensive to install and should always be designed by a qualified person.
- If planned to store water, a grade stabilization structure can also provide a water source and habitat for wildlife.
- Adequate soil conservation practices are needed upstream of the structure to avoid sedimentation.
- Check to see if any permits are required.

Maintenance

- Remove trees and shrubs within 30 feet of the structure.
- Keep burrowing animals away from earthen structures.
- Repair cracks in concrete.
- Keep inlets, outlets and the area 50 feet downstream of the outlet free of debris.

Water and Sediment Control Basin

A small earthen embankment built across the bottom of a drainageway to temporarily store runoff.

How it Works

An earthen embankment acts similar to a terrace. It traps water and sediment running off cropland upslope from the structure, and reduces gully erosion by controlling flow within the drainage area. The basin releases water slowly, usually through infiltration or a pipe outlet and tile line. Basins can be effective in reducing sedimentation of nearby waters, especially in areas where residue management or other practices are impractical.

Planning

- The area draining to the basin is usually not larger than 30 acres.
- The basin should be large enough to control runoff from the 10-year, 24-hour storm.
- Some sites are too steep for a basin to work effectively.
- Location (and spacing of multiple basins) depends on slope, tillage and crop management; NRCS can provide advice.
- Erosion control practices are needed upslope to prevent excess sedimentation.
- The fill material used to construct the embankment should be free of debris such as sod, roots, large stones, etc. and be well compacted.

Maintenance

- Reseed and fertilize as needed to maintain vegetation.
- Check the basin after large storms to determine the need for sediment removal. Make needed repairs to the embankment.

Planting grass, legumes or other vegetation to protect small, badly eroding areas.

How it Works

Permanent vegetation stabilizes areas such as gullies, over-grazed hillsides or terrace backslopes. While the primary goal is erosion control, the vegetation can also serve as nesting cover for birds and small animals.

Planning

- Other soil conservation measures may be needed above the critical area to ensure stabilization. Sometimes, other conservation practices will be sufficient to stabilize a badly eroding area.
- Consider whether the area will serve as nesting cover, and select plantings accordingly. Native grasses and wildflowers add beauty and wildlife.
- Bare slopes or areas disturbed during construction should be mulched to provide temporary protection.
- Annual grasses may be needed until permanent vegetation is established. Consider oats or a similar nurse crop in severely eroded areas. (Mow oats before they head out and mow high to avoid clipping the permanent vegetation.)
- Lime and fertilizer may be needed before planting.

Maintenance

- Permanently exclude livestock from steep slopes.
- In areas where grazing will be allowed, do not allow grazing for a year after planting, and prevent overgrazing once permanent cover is established.
- Delay mowing until July 15 to protect ground-nesting birds.
- Native grasses may benefit from periodic burning, which stimulates new growth and controls competing plants.

Structural practices that can help protect water quality and make manure management more convenient for the farmer.

How it Works

Along with a nutrient management plan, many farmers use manure storage structures and barnyard runoff controls to improve manure management and protect water quality. Storage allows manure to be safely stockpiled until conditions are environmentally safe for spreading. Runoff controls such as diversions, rain gutters, settling basins and filter strips keep clean water from flowing over manure-covered areas and clean up runoff water before it reaches a waterway.

Planning

- A diversion around an animal lot and gutters on buildings are inexpensive and effective ways to minimize the amount of water falling on and washing across manure covered areas. A diversion is often the first step in solving a runoff problem.
- Incorporating a concrete wall with an outlet box at the lower end of the lot controls the rate of runoff to filter areas, and allows trapped manure to be easily scraped and removed. A grass filter strip cleans up water that leaves the lot.
- Four types of storage are common in Wisconsin: walled enclosures, earthen ponds, above-ground tanks and under-floor storage. Before deciding on manure storage, carefully consider your operation, siting or design limitations, bedding, transfer to storage, local and state regulations and costs.
- Consider that the costs of storage, even with cost-sharing, are seldom offset by the fertilizer savings. Costs range from $100 per cow for earthen ponds to $1,000 per cow for above ground tanks.

Maintenance

- Runoff controls require regular maintenance. Gutters need to be cleaned, filter strips cut and reseeded as needed, and the yard and outlet box regularly scraped and cleaned.
- Manure storage structures need to be checked regularly for leaks or structural damage. Leaking structures can pose a significant threat to surface water and groundwater.

Unused wells that are filled and sealed to prevent surface runoff from contaminating drinking water aquifers.

How it Works

Many farms have unused wells. Pollutants that enter these wells move quickly and without filtration to groundwater. Large open wells themselves can pose a safety hazard to children and animals. Abandoned wells are sealed by removing pumps, piping and debris, and filling the hole with a slurry of cement or bentonite chips.

Planning

- Locate unused wells. Pipes sticking out of the ground around the farmstead and old windmills often indicate well locations. Other locations may not be as obvious. Check depressions in the ground, basements, under front steps and near old cisterns.
- The Wisconsin Geological and Natural History Survey in Madison maintains well construction reports, and may have a record of the type and depth of wells on your property.

- Determine the type of well to be sealed. Driven sand points, drilled wells and dug wells are the three main types in Wisconsin. Deep drilled wells may need to be sealed by a registered well driller; driven and dug wells may often be sealed by the landowner.
- Wisconsin well regulations require reports of well sealing. Before sealing a well, check with the local DNR office for exact requirements.

Maintenance

- Dug wells that have been filled may have a cover of earth. This should be checked for subsidence, and earth added to prevent water ponding in the depression.

Strips or small areas of land in permanent vegetation that help control pollutants and promote other environmental benefits.

How it Works

Riparian vegetative buffers are strips of grass, trees or shrubs established along streams, ditches, wetlands or other water bodies. Riparian buffers trap sediment, filter nutrients, and provide habitat and corridors for fish and wildlife.

Planning

- Work with a conservationist to select plants for the buffer and determine its width.
- Soil conservation measures will be needed above filter strips to keep them from being overloaded with sediment.
- Control grazing on buffer areas.

Maintenance

- Rills or small channels may develop in grass areas and need to be repaired and reseeded.
- Control weeds and brush in grass buffers.
- Delay mowing grass areas until after July 15 to protect nesting birds.
- Remove sediment and reseed the buffer periodically.

Protecting a stream or other body of water by re-shaping and stabilizing the bank and excluding livestock.

How it Works

Where stream banks are eroded, they are re-shaped and seeded, and sometimes protected with rock rip-rap or seeded with bio-engineering materials. In some cases a special wood structure (lunker) is fitted into the bank to stabilize it and provide fish habitat. Stabilizing the streambank or shoreline protects water quality, improves fish habitat, and the vegetation provides habitat for birds and small animals. Fencing restricts livestock access to the bank or shore, with the exception of controlled areas for drinking or crossing.

Planning

- If you have livestock, plan to install an alternate watering system away from the stream, or a stream crossing that can also provide access to water.
- In areas that are prone to flooding, single or double wire electric fences with flexible line posts may be more practical than other types of fence.
- Remove large obstacles such as logs and stumps from the stream bed if they are causing turbulence along the banks. (Check with the local DNR office for possible permit requirements.)

Maintenance

- Keep fences repaired.
- Remove off-stream watering systems in winter, if necessary.
- Control undesirable tree growth.

Restoring a previously drained wetland by filling ditches or removing or breaking tile drains.

How it Works

Where wetlands have been drained and farmed, subsurface and surface drains are plugged or removed so water can refill the area. In other cases, low-lying areas are scraped to form a shallow basin, and small dikes or embankments are installed to establish and maintain water levels. Native wetland vegetation can be planted to enhance existing plants. The wetland temporarily holds runoff (reducing flooding downstream), and filters sediment, nutrients and chemicals before the water recharges groundwater. America's ducks and geese rely on wetlands, as do hundreds of species of plants, amphibians and native birds.

Planning

- Consult local DNR and county zoning offices for necessary permits.
- Check with local NRCS offices for soils information, and design and construction standards.
- Make sure soils at the site will hold water.
- Consider whether plugging drains or breaking tile lines will have adverse effects on other parts of your farm, neighboring farms or established drainage districts.
- Exclude livestock from the area.
- Establish vegetative cover on embankments and spillways.
- Existing natural seed banks will sometimes regenerate native vegetation in the wetland.
- Adjacent upland nesting cover greatly improves the value of wetlands for wildlife.

Maintenance

- Replanting wetland vegetation may be needed until a good stand is established.
- Control beavers and muskrats, and keep burrowing rodents out of dikes.
- Remove debris from pipe inlets and outlets.
- Inspect and repair pipes or water control structures.